California State University, Fresno

Lyles College of Engineering

Civil Engineering Program (BSCE), Department of Civil & Geomatics Engineering

Program Assessment Coordinator: Ching Chiaw Choo

Student Outcomes Assessment Plan (SOAP)

I. Mission Statement

The Civil Engineering Program at California State University Fresno, Fresno CA, strives to provide high quality education required for students to fully develop their professional qualities and skills as civil engineering, and to develop their personal potential to the greatest extent possible to serve the Central Valley and society at large.

II. Institutional Learning Outcomes, Program Learning Outcomes/Goals, and SLO's

A. Institutional Learning Outcomes (ILOs).

Fresno State's ILOs are posted on the following webpage: http://fresnostate.edu/academics/oie/assessment/fresno-state-assessment.html, and they state that students who graduate from California State University, Fresno will demonstrate the importance of discovery, diversity, and distinction by

1. **developing a foundational, broad and integrative knowledge** of the humanities, the arts, the sciences, and social sciences, and their integration with their major field of study. Students will consolidate learning from different fields and explore the concepts and questions that bridge those essential areas of learning. Graduate students will articulate the significance, implications and challenges within their field in a societal and global context. In fields in which interdisciplinarity is fundamental, graduate students will further draw from the perspectives of other domains of inquiry/practice so as to assess a problem better and offer solutions to it,
2. **acquiring specialized knowledge** as identified by program learning outcomes in their major field. Students will demonstrate expertise in a specialized area of study, including integration of ideas, methods, theory and practice. Graduate students will demonstrate further mastery of the field's theories, research methods, and approaches to inquiry. They will also show the ability to assess major contributions to the field, as well as expand on those contributions through empirical research or aesthetic exploration,
3. **improving intellectual skills** including critical thinking, effective oral and written communication, information literacy and quantitative reasoning. Students will demonstrate fluency via application of these skills to everyday problems and complex challenges. Graduate students will hone these skills further, demonstrating coherent arguments, analysis, insight,

creativity, and acumen as they address local, regional, and global issues in their respective fields of study,

4. **applying knowledge** by integrating theory, practice, and problem solving to address real world issues using both individual and team approaches. Students will apply their knowledge in a project, paper, exhibit, performance, or other appropriate demonstration that links knowledge and skills acquired at the university with those from other areas of their lives. Graduate students will integrate knowledge and skills from coursework, practicum, and research to address critical issues in their field and demonstrate advanced application of knowledge through a culminating experience that validates, challenges, and/or expands the profession's body of knowledge, and
5. **exemplifying equity, ethics, and engagement.** Students will form and effectively communicate their own evidence-based and reasoned views on public issues, interact with others to address social, environmental and economic challenges, apply knowledge of diversity and cultural competencies to promote equity and social justice in the classroom and the community, value the complexity of ethical decision making in a diverse society, acknowledge the importance of standards in academic and professional integrity, and demonstrate honesty, tolerance, and civility in social and academic interactions. Building upon this at the graduate level, students will apply these values in the creation of scholarly and/or aesthetic works that enrich the human experience.

B. Program Education Objectives (PEOs) and Student Outcomes (SOs)

BSCE's PEOs and SOs are published here:
https://engineering.fresnostate.edu/civil/accreditation.html

Program Education Objectives [PEO (a) – (d)] are broad statements describing the career and professional accomplishments the Program is preparing its graduates to achieve, 3 to 5 years after graduating from the program. Student Outcomes are specific knowledge and skills that are measurable the program expects students to acquire by the time of graduation. The BSCE program adopts ABET's SO **1** through **7** verbatim as its SOs. BSCE's SOs are related to PEOs as follows:

PEO (a) Technical Aptitude: Be employed as engineers with the ability to use their technical knowledge, design, and problem-solving skills for effective professional practice throughout their careers

1. SO **1**: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. SO **2**: An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. SO **6**: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
4. SO **7**: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

PEO (b) Life-Long Development: Exercise capabilities for life-long learning as a mean to enhance their technical and professional skills, to continuously enrich themselves and benefit the communities they are serving and beyond

1. SO **1**: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. SO **3**: An ability to communicate effectively with a range of audiences.
3. SO **4**: An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
4. SO **7**: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

PEO (c) Collaborative Spirit: Develop interpersonal and collaborative skills that function well amongst a diverse group of professionals for a productive career

1. SO **3**: An ability to communicate effectively with a range of audiences.
2. SO **5**: An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

PEO (d) Professional Advancement: Advance and support the engineering profession through participation of professional societies, civic groups, and educational institutions; and/or establish a distinctive record of professional achievements

1. SO **1**: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. SO **2**: An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. SO **3**: An ability to communicate effectively with a range of audiences.
4. SO **4**: An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

III. Curriculum Map: BSCE Courses in which SOs are addressed (NOTE: this list excludes courses in mathematics, basic sciences, engineering topics outside of BSCE, BSCE electives, and general education)

BSCE Core Courses (units)	SO 1	SO 2	SO 3	SO 4	SO 5	SO 6	SO 7
CE 1 or ENGR 1 (1)	I	I	I	M	I	I	I
CE 2 (1)	I		D				
CE 20 (3)	D						
CE 80 (3)	D						M
CE 121L (1)	M				D	M	
CE 123 (3)	M						
CE 123L (1)	M				M	M	
CE 128 (3)	M						
CE 129 (1)	M				D	M	
CE 130 (3)	M						
CE 132 (3)	M	M					D
CE 150 (3)	M	M	M		M		M
CE 150L (1)	M	M				M	
CE 170 (1)	M						

BSCE Core Courses (units)	SO 1	SO 2	SO 3	SO 4	SO 5	SO 6	SO 7
CE 176 (3)	M	M					
CE 176L (1)	M	M			M	M	
CE 180A (2)	M		M		M		
CE 180B (2)	M	M	M	M	M		M
CE 185 (2)	M			M			

I = Introduced D = Developed M=Mastered

IV. SOs Mapped to Assessment Measures and Methods

Assessment Measure	Evaluation Method	SO 1	SO 2	SO 3	SO 4	SO 5	SO 6	SO 7
Elements of Capstone senior projects (CE180A & CE180B)	Direct	√	√	√	√	√		
Body-of-knowledge (Various BSCE courses)	Direct	√	√	√	√	√	√	√
Fundamental of Engineering (FE) exam	Direct	√			√			
Course survey (Various BSCE courses)	Indirect	√	√	√	√	√	√	√
Junior-Senior survey (Various BSCE courses)	Indirect	√	√	√	√	√	√	√
Graduating Senior (or Exit) survey	Indirect	√	√	√	√	√	√	√

V. Assessment Measures: Description of Assignment and Method (rubric, criteria, etc.) used to evaluate the assignment

A. Direct Measures

1. Task management report (CE180B)
2. Capstone final report (CE180B) – *see rubric (Page 9 of this SOAP)*
3. Capstone presentation (CE180B) – *see rubric (Page 10 of this SOAP)*
4. Body-of-knowledge assessment in various BSCE courses – this assessment draws inspiration from ASCE's Body-of-knowledge for the 21st century, in which specific knowledge and skills are assessed using a variety of qualitative methods, including embedded question(s), specified assignment/quiz, research paper, poster, etc., deemed appropriate by the instructor(s).

5. Fundamental of Engineering (FE) exam – the FE exam is administered by the National Council of Examiners for Engineering and Surveying (NCEES). The FE exam is the only nationally normed exam that addresses specific engineering topics, mathematics & statistics, as well ethics and professional practice.

B. Indirect Measures (Department/Program must use a minimum of one indirect measure)

1. Course survey in various BSCE courses
2. Junior-Senior survey in various BSCE courses
3. Graduating Senior (or Exit) survey – *see Fig. 1 (Pages 11 to 14 of this SOAP)*

VI. Data Collection Schedule/Timeline

Academic Year	Term	Measures	SO 1	SO 2	SO 3	SO 4	SO 5	SO 6	SO 7
2023-24	Fall	CE180B's (1) – (3)	√	√	√	√	√		
		BOK in selected courses	*	*	*	*	*	*	*
		JEDI assessment	*						
		Graduating senior survey	√	√	√	√	√	√	√
	Spring	CE180B's (1) – (3)	√	√	√	√	√		
		Course survey	*	*	*	*	*	*	*
		Junior-senior survey	√	√	√	√	√	√	√
		Graduating senior survey	√	√	√	√	√	√	√
2024-25	Fall	CE180B's (1) – (3)	√	√	√	√	√		
		Graduating senior survey	√	√	√	√	√	√	√
	Spring	CE180B's (1) – (3)	√	√	√	√	√		
		Graduating senior survey	√	√	√	√	√	√	√
2025-26	Fall	CE180B's (1) – (3)	√	√	√	√	√		
		BOK in selected courses	*	*	*	*	*	*	*
		Graduating senior survey	√	√	√	√	√	√	√
	Spring	CE180B's (1) – (3)	√	√	√	√	√		
		Course survey	*	*	*	*	*	*	*
		Junior-senior survey	√	√	√	√	√	√	√
		Graduating senior survey	√	√	√	√	√	√	√
2026-27	Fall	CE180B's (1) – (3)	√	√	√	√	√		
		JEDI assessment	*						
		Graduating senior survey	√	√	√	√	√	√	√
	Spring	CE180B's (1) – (3)	√	√	√	√	√		
		Graduating senior survey	√	√	√	√	√	√	√
2027-28	Fall	CE180B's (1) – (3)	√	√	√	√	√		
		BOK in selected courses	*	*	*	*	*	*	*
		Graduating senior survey	√	√	√	√	√	√	√
	Spring	CE180B's (1) – (3)	√	√	√	√	√		
		Course survey	*	*	*	*	*	*	*
		Junior-senior survey	√	√	√	√	√	√	√
		Graduating senior survey	√	√	√	√	√	√	√
2028-29	Fall	CE180B's (1) – (3)	√	√	√	√	√		
		Graduating senior survey	√	√	√	√	√	√	√

Academic Year	Term	Measures	SO 1	SO 2	SO 3	SO 4	SO 5	SO 6	SO 7
	Spring	CE180B's (1) – (3)	√	√	√	√	√		
		Graduating senior survey	√	√	√	√	√	√	√
2029-30	Fall	CE180B's (1) – (3)	√	√	√	√	√		
		BOK in selected courses	*	*	*	*	*	*	*
		JEDI assessment	*						
		Graduating senior survey	√	√	√	√	√	√	√
	Spring	CE180B's (1) – (3)	√	√	√	√	√		
		Course survey	*	*	*	*	*	*	*
		Junior-senior survey	√	√	√	√	√	√	√
		Graduating senior survey	√	√	√	√	√	√	√
2030-31	Fall	CE180B's (1) – (3)	√	√	√	√	√		
		Graduating senior survey	√	√	√	√	√	√	√
	Spring	CE180B's (1) – (3)	√	√	√	√	√		
		Graduating senior survey	√	√	√	√	√	√	√
2031-32	Fall	CE180B's (1) – (3)	√	√	√	√	√		
		BOK in selected courses	*	*	*	*	*	*	*
		Graduating senior survey	√	√	√	√	√	√	√
	Spring	CE180B's (1) – (3)	√	√	√	√	√		
		Course survey	*	*	*	*	*	*	*
		Junior-senior survey	√	√	√	√	√	√	√
		Graduating senior survey	√	√	√	√	√	√	√
2032-33	Fall	CE180B's (1) – (3)	√	√	√	√	√		
		JEDI assessment	*						
		Graduating senior survey	√	√	√	√	√	√	√
	Spring	CE180B's (1) – (3)	√	√	√	√	√		
		Graduating senior survey	√	√	√	√	√	√	√

* SO(s) measured dependent upon selected BSCE course(s)

Summary of assessments, including their frequency:

- CE180B's (1) – (3) — Every term (or twice per AY)
- Graduating senior survey — Every term (or twice per AY)
- BOK in selected courses — Once every two AYs (fall term only)
- Course survey — Once every two AYs (spring term only)
- Junior-Senior survey — Once every two AYs (spring term only)
- JEDI assessment — Once every three AYs (fall term only)
- FE exam — When available

VII. Closing the Loop

Fresno State Closing the Loop process is described immediately below.

A major assessment report, which focuses on assessment activities carried out the previous academic year, is submitted in September of each academic year and evaluated by the Learning Assessment Team and Director of Assessment at Fresno State.

Program/Department Closing the Loop process:

(1) Annual review & discussion of assessment data (NOTE: data to be collected, analyzed, and evaluated per established schedule) of prior year by faculty and CE Advisory Board in early September. An annual program assessment report detailing the results from the prior year and future program changes, if any, is then prepared and submitted for review at the University level (Due, September 30, on yearly basis).
(2) Review, and revise as needed, of Program's PEOs, and their relations with SOs, by Program's constituencies (i.e., CE faculty, CE students, and CE Advisory Board) once every three years (i.e., 2020, 2023, 2026, 2029, 2032, etc.).
(3) Every six years, the BSCE program undergoes national re-accreditation review by the Accreditation Board for Engineering and Technology (ABET). The re-accreditation review involves compilation and submission of a program/major self-study report (July of the review calendar year) and other program materials. A campus visit by ABET to follow in the fall of the same calendar year.
(4) Consistent with ABET re-accreditation review cycle (i.e., every six years), the BSCE program undergoes internal program review (i.e., abbreviated review for nationally accredited program) at the University level.

SAMPLE INSTRUMENTS OF ASSESSMENT

CAPSTONE (CE 180B) FINAL DESIGN REPORT RUBRIC

Grading
The grade is evaluated based on the overall score from all rubric components.

3.5 or more	2.5 to less than 3.5	1.5 to less than 2.5	1.0 to less than 1.5	Less than 1.0
A	B	C	D	E

Criteria	Excellent (4)	Very Good (3)	Satisfactory (2)	Unsatisfactory
Engineering Calculations (x2)	Complete set of calculations per professional standard of practice in the discipline including assumptions, references, methodologies, and outcomes.	Calculations are complete with few exceptions, minor errors and omissions are present but do not alter the outcome.	Some components of calculations are missing, some errors and omissions adversely impact the accuracy of results	Incomplete and/or incorrect calculations, Unjustified assumptions, Inappropriate application of methodologies and standards.
Plans and Drawings (x2)	Correct sheet size and fold, title block, and layout. Excellent graphical presentations and selections of plans, sections, elevations, and details. Legible lettering and numerals. Clear and correct line types, hatches, and symbols. Proper organization of drawings set and file handling.	Few errors in sheet layout or graphical presentations and components. Missing few views, sections, or details. Lettering, numerals, line types, hatches, and/or symbols are not clear but still legible.	Many drawings have wrong size, fold, or layout, several plans, sections, or details are missing or incorrect, poor graphical presentations, poor organization of the set and handling of files.	Drawings are not prepared based on any consistent standards. It is not possible to find or understand plans, sections, or details, information on drawings are not readable or clear, no attempt to build a set.
Codes / Standard Specifications (x2)	Complete and clear set of Specifications using appropriate style including material requirements, quality standards, codes and regulations. Coordination of work among different disciplines, safety and environmental requirements, permits, and reference data are clearly stated.	Specifications are complete with few exceptions. Writing is correct with few style or formatting issues.	Specification is not complete, but understandable. Several errors in style or format (e.g., irrelevant, repetitive, or long text).	Major errors and incorrect or conflicting information in specifications.
Engineering Estimates	Complete and updated line items using Appropriate approach to cost estimate at design stage.	Few errors and/or omissions in cost estimate.	Many errors and/or omissions, estimate is not fully based on final design outcomes.	Estimate is not updated based on final design outcomes.
Challenges and Innovations	Project incorporates several innovative design strategies, and/or includes challenging work that was not included in typical coursework.	Project incorporates at least on innovative design strategy, and/or includes challenging approach to a typical work which would be considered an extension of typical coursework.	Project identifies opportunities of innovative design strategies, but fails to incorporate them properly, and /or includes an attempt to challenge the typical approach to the work.	Project is similar to a typical textbook example as covered in the coursework.
Sustainability	Project is qualified for Platinum Award as recognized by ISI Envision Rating System.	Project is qualified for Gold Award as recognized by ISI Envision Rating System.	Project is qualified for Silver Award as recognized by ISI Envision Rating System.	Project is qualified for Acknowledgement of Merit as recognized by ISI Envision Rating System.
Overall Organization	High quality of format and presentation is demonstrated. Texts, drawings, and equations are prepared by appropriate software. Tabs and indices aid reader to find information.	Good quality of format and presentation is demonstrated. However, some materials are not camera-ready per publication standards. Tabs and indices are not consistent or complete.	Format and presentation is fair, but, includes many draft quality text, drawings, equations, etc. Reader cannot rely on tabs and indices to find information.	The materials are hand-written and hand-sketched, representing the very first draft of the work. Tabs and/or indices are missing or misleading.

CAPSTONE TEAM PRESENTATION RUBRIC

Grading

The grade is evaluated based on the overall score from all rubric components.

3.5 or more	2.5 to less than 3.5	1.5 to less than 2.5	1.0 to less than 1.5	Less than 1.0
A	B	C	D	E

Presentation Rubric

Project presentations are graded based on the clarity, delivery, organization, technical content, and addressing questions. Presentations should meet expectations of faculty instructor, faculty advisor, professional mentor, and audiences. Students are responsible to overcome potential conflicts and challenges.

Criteria	Excellent (4)	Very Good (3)	Satisfactory (2)	Unsatisfactory
Overview (Title, introduction, outline)	Title is concise and informative, all members are introduced in a consistent manner, and the outline is complete.	Title needs refinement, introduction is complete but not consistent, and/or outline is not complete.	Title needs correction or length adjustment. Incomplete introduction, improper outline.	Title is misleading, there are errors in introduction, and/or outline confuses audience.
Voice (Volume, clarity, and rate of speech)	Presenter is easy to hear. Rates of speech are appropriate.	Audience is able to hear as a whole, but there are times when volume is not quite adequate. Speaker may at times seem like s/he is rushing or exaggerating pauses.	Presenter is often difficult to hear. The rates of speaking are often inappropriate.	Presenter is difficult to hear. The rates of speaking are too slow or too fast.
Delivery (Engagement, enthusiasm, and mannerisms)	Presentation involves audience, allowing time for audience to think and respond. Speaker makes eye contact with everyone and has no nervous habits. Speaker has excellent posture.	Audience is involved but Inadequate processing or response time is provided. Eye contact may focus on only select few members. Mildly distracting nervous habits are present in the beginning only and do not override the content.	Audience is rarely involved. Inadequate processing or response time is provided. Very little eye contact is made, may be with only one member of the audience. Mildly distracting nervous habits are present throughout the presentation.	Speaker does not involve audience. No little eye contact is made with the audience. It may sound like the speaker is reading the presentation. Nervous habits that distract the audience are present.
Audiovisual Materials (Quantity and quality)	Visual aids are well done and are used to make presentation more interesting and meaningful.	Visuals aids are adequate but do not inspire engagement with the material.	Very little or poor use of visual materials.	Visual aids are adversely impacting the quality of presentation.
Organization (Logical progression and team coordination)	Presentation is well organized with a beginning, middle, and end. There is a strong Organizing theme, with clear main ideas and transitions.	Presentation is well organized with few interruptions in the flow of information.	Speakers lose train of thought, do not stay with the proposed outline, or connections are attempted but not made clear for the audience.	Presentation shows little organization, unclear purpose, and/or unclear relationships.
Technical Content (Correct and complete)	Information is complete and accurate. Clear evidence of in depth analysis and research.	Research and analysis component is less evident. Resources are present but less than adequate for assignment.	Details and examples are lacking or not well-chosen for the topic or audience. Lacks evidence of research or analysis.	Content is not clear. Audience is confused or misinformed.
Time Management (Length and completeness)	Appropriate length. Clear summary is provided. Audience is involved in synthesizing the information.	Time is appropriately used, but may run slightly over or under allotted time.	The length is substantially over or under allotted time and/or information is not tied together or conclusion is inadequate.	Presentation lacks conclusion and/or time is not appropriately used.
Addressing Questions	Speaker is relax, self-confident, and respectful, self-reliant on information, describes the project at a proper level to audience, helps other members to response.	Answers are smooth and respectful, somehow self reliant on information, describing project in somehow understandable level, does not contribute to group response.	Mildly nervous habits exist, not confident about information, and level of description is not appropriate, relies on other members of the group for response.	Nervous habits distract the audience, lacks of respect, incorrect information about the project, inappropriate level of description, liability to the group.

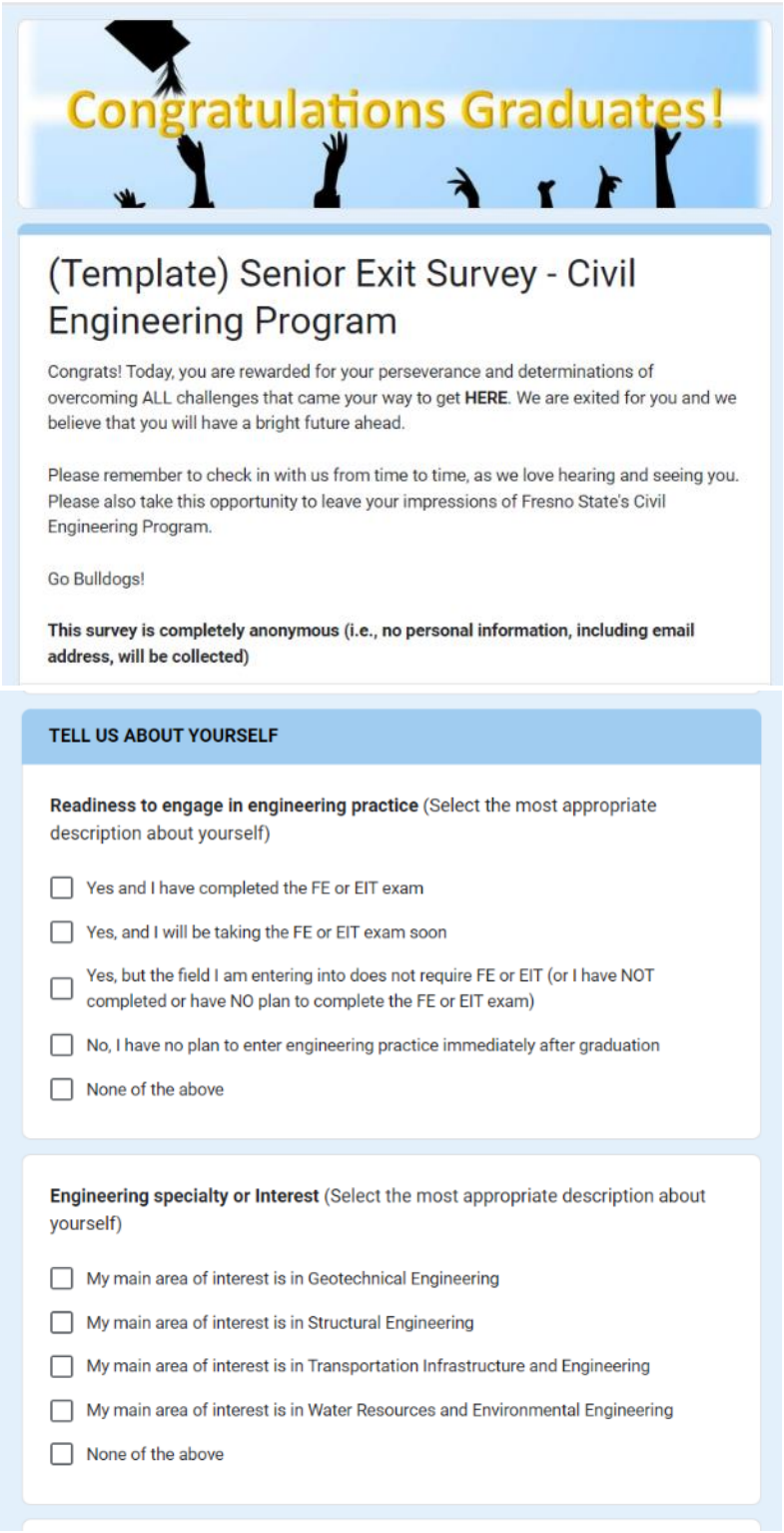

Fig. 1 – Graduating Senior Survey (i.e., Exit Survey)

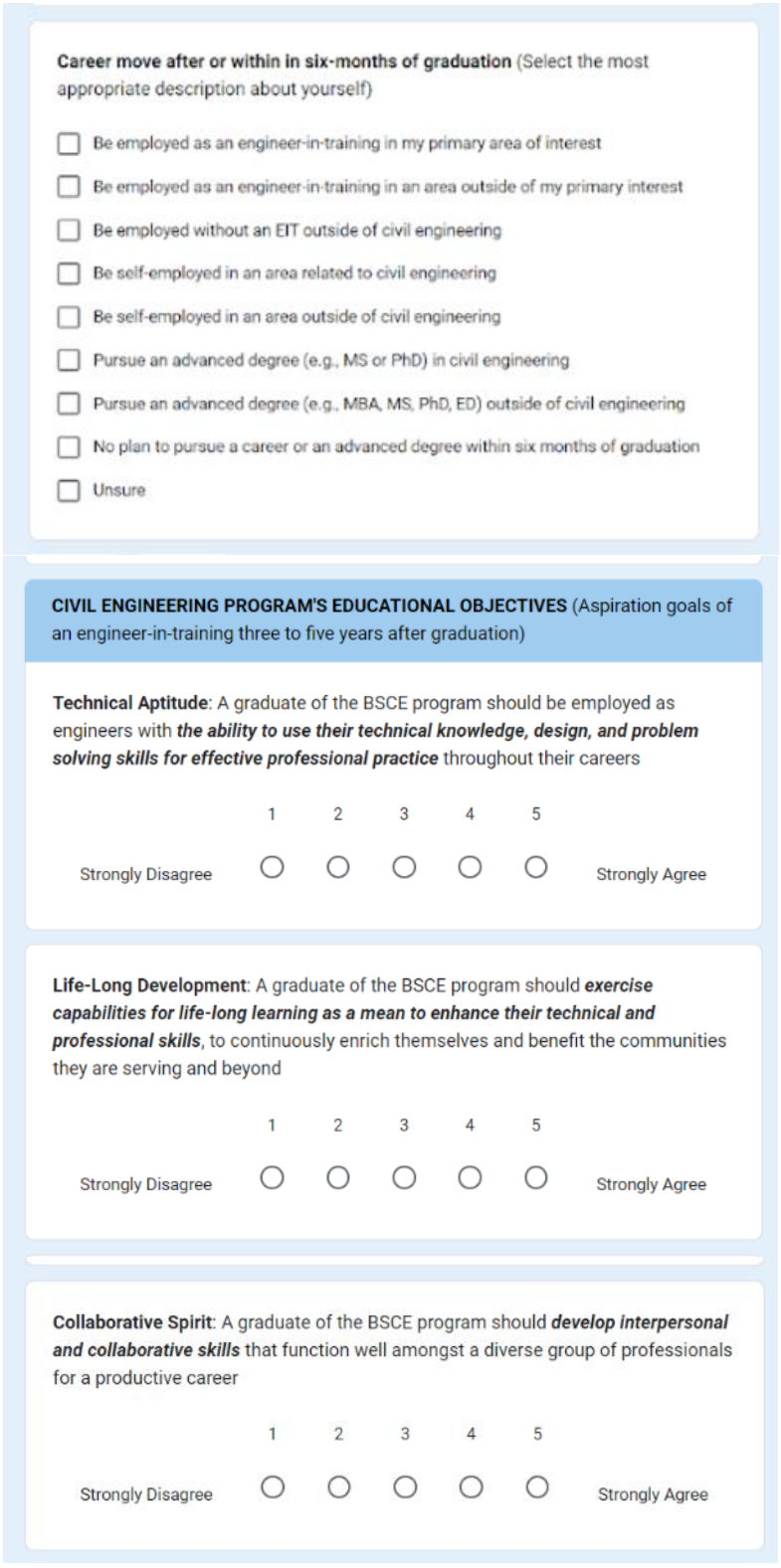

Fig. 1 – Graduating Senior Survey (i.e., Exit Survey) (cont'd)

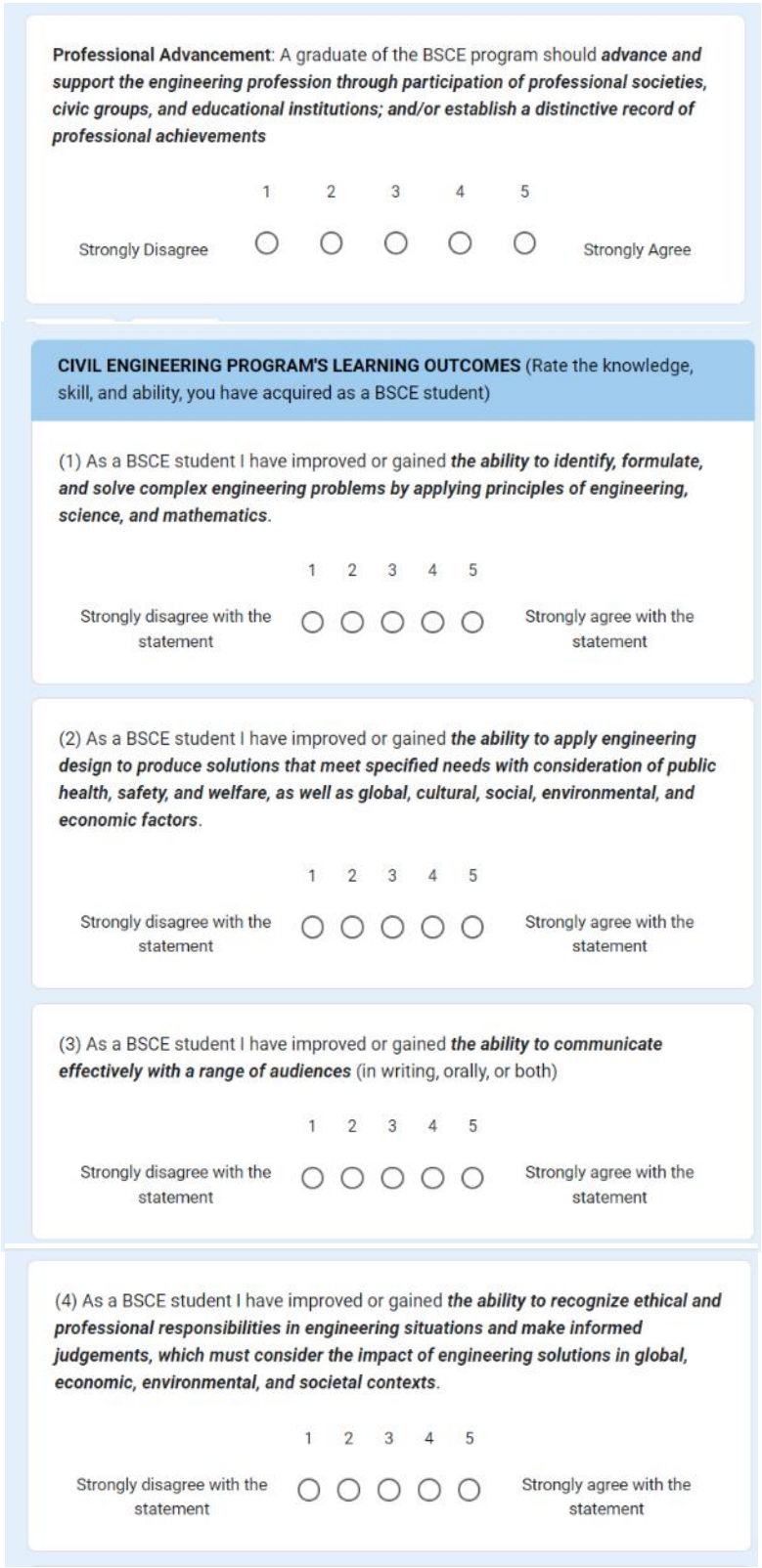

Fig. 1 – Graduating Seniors Survey (i.e., Exit Survey) (cont'd)

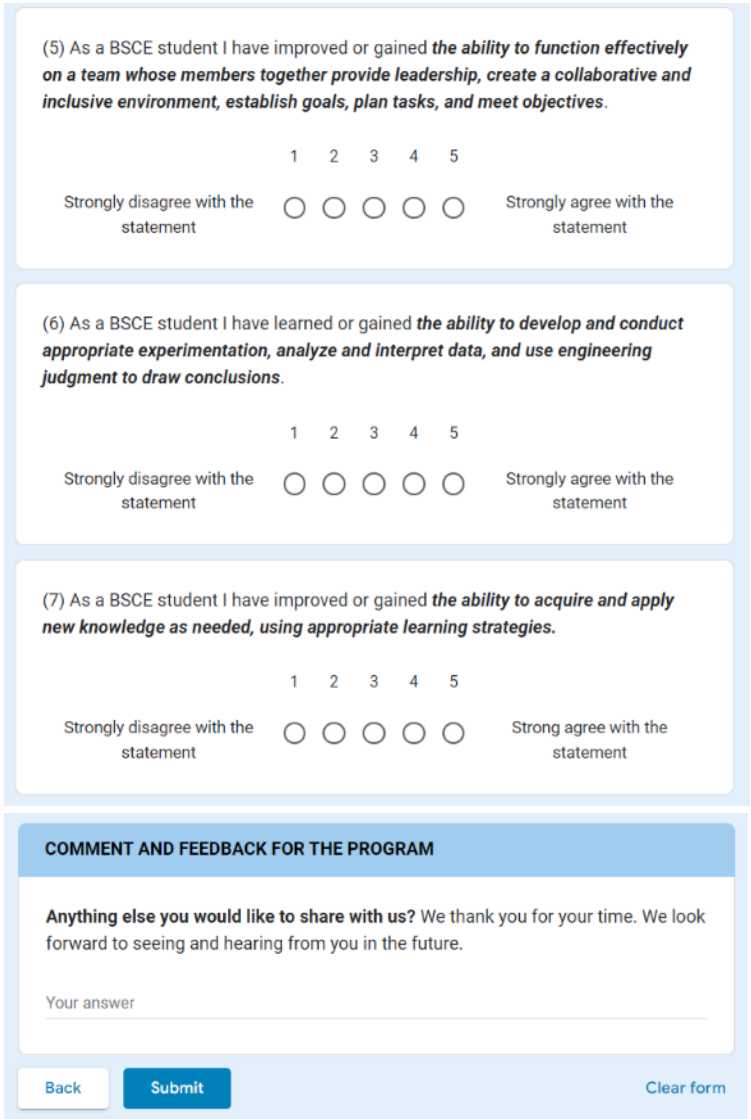

Fig. 1 – Graduating Seniors Survey (i.e., Exit Survey) (cont'd)